President's Address: Research in Jeopardy

Written by Jill Shuman

The President's Address was presented by American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) president Daniel H. Teitelbaum, MD, C.S. Mott Children's Hospital, University of Michigan, Ann Arbor, Michigan, USA. Dr Teitelbaum is a pediatric surgeon with an international reputation in the surgical care of infants and children with Hirschsprung disease, colorectal anomalies, and short bowel syndrome. He has an active research laboratory that focuses on the nutritional care of patients with short bowel syndrome, parenteral nutrition, and the development of devices to lengthen the intestine for the treatment of short bowel syndrome.

The theme of his address was the key role that government funding—or lack thereof—plays in advancing nutrition research. As an illustration, he outlined the development of ranitidine, a histamine-2 (H_2) blocker and an additive in almost every bag of parenteral nutrition.

In 1910, Henry Dale—an employee of a British research and pharmaceutical company known as Wellcome Physiological Research Laboratories—discovered histamine; he was later knighted and won a Nobel Prize for his work. Histamine is an organic nitrogenous compound involved in local immune responses, gastric acid secretion, and neurotransmission. The initial discovery of histamine was followed by the discovery of the first antihistamines by a number of researchers funded by universities, the pharmaceutical industry, and the government. However, the researchers were unable to determine why these drugs had no effect on acid production in the stomach.

The mystery was not unraveled until 1964, when researchers led by James Black at Smith, Kline & French hypothesized that there were 2 distinct histamine receptors. The receptor that responded to traditional antihistamines was designated H_1, and the one in the stomach was designated H_2. Black went on to lead a team that identified the first class of anti-H_2 receptor antagonist drugs, one of which was cimetidine, and to win a Nobel Prize in 1988.

Dr Teitelbaum emphasized that this 3-pronged funding approach (including academia, industry, and government) produced a remarkable and sustainable class of drugs. He also noted that commercial sales for this class of drugs have totaled approximately $58 billion US dollars from 1979 to today, almost twice the 2014 budget of the National Institutes of Health (NIH) [NIH. www.nih.gov. Accessed February 25, 2015].

Unfortunately, if any 1 of the 3 funding elements collapses, innovation suffers. Regrettably, most corporations and government funding agencies no longer demonstrate the commitment to support such endeavors over the 60 years it took to develop the H_2 antagonists. Virtually all corporations are driven by yearly or even quarterly profit reports. A decline in profits means pulling back from novel research areas, some of which might represent the next great scientific advancement. A 62-year commitment is not practical in today's financial environment, and most NIH study sections will not support projects lasting beyond 2 to 3 funding cycles.

NIH funding has been the key driver of innovative academic research in US academic institutions. Yet NIH funding has not increased in more than a decade [Federation of American Societies for Experimental Biology. *Federal Funding for Biomedical and Related Life Sciences Research*. 2015], and, in fact, it has declined by 20% since 2004 (Figure 1) [NIH. www.nih.gov. Accessed February 25, 2015]. When corrected for inflation and compared with the equivalent of 1985 dollars, funding for US research has not increased since 1985 (Figure 2).

The classic funding level for a standard NIH R01 grant, the main funding source for most academics, has remained at $250,000 for the past 25 years [NIH. www.nih.gov. Accessed February 25, 2015]. This has forced researchers to pay 2014 wages and 2014 expenses with the equivalent of 1985 dollars. The result is less research productivity, fewer successfully funded laboratories, and many fewer investigators willing to take up the challenge.

Referencing a popular movie, Dr Teitelbaum described the current state of research as "frozen." Research scientists have truly entered into an "ice age." As funding levels decline, the chances

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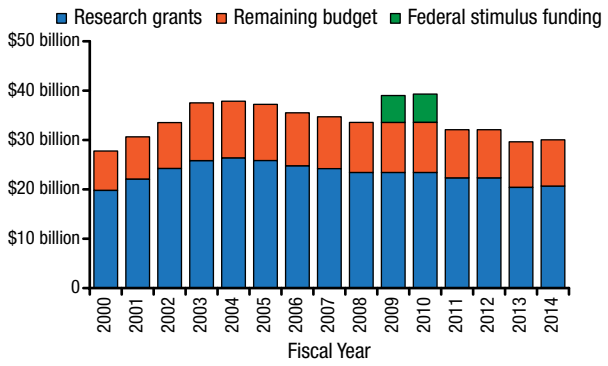
Figure 1. NIH Budget by Fiscal Year, 2014 Dollars



NIH, National Institutes of Health.
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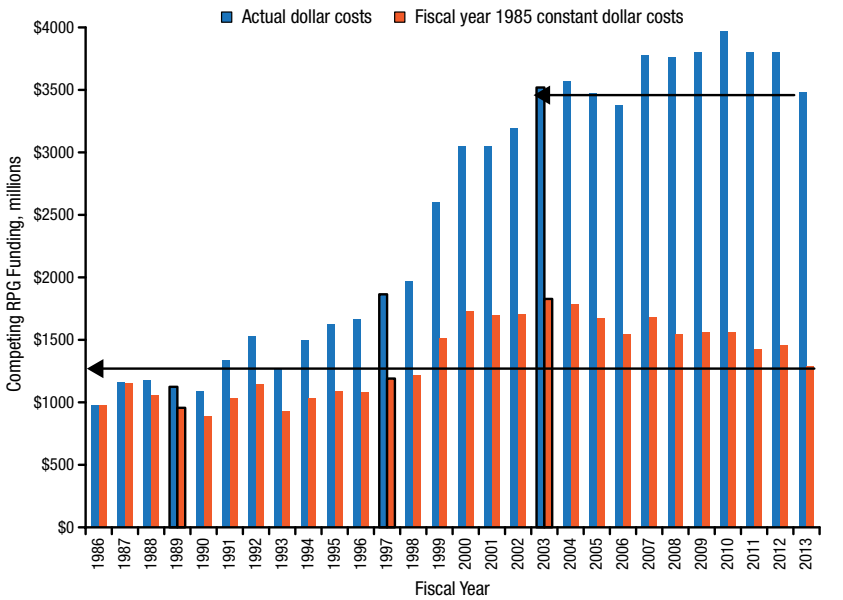
of being funded are at historically low levels. In fact, the likelihood of being funded for a first R-level grant submission is only 8%. For those who do not make this cut, the outcome is becoming quite dismal.

According to Dr Teitelbaum, >3500 established NIH investigators will permanently shut down their laboratories in 2015. The loss of each laboratory leads to the loss of knowledge, experience, and a line of work that may never be replaced. The closure of a laboratory also represents the loss of future ideas and innovations. Less than 16% of new graduates with PhDs will obtain a faculty position, and <10% of PhDs will ever become a principle investigator. More postdocs will be forced to move from research into other careers, such as consulting, industry sales, clinical work, or teaching.

Dr Teitelbaum compared the current state of government funding with the ancient Greek myth of Daedalus and his son Icarus. Daedalus and Icarus cleverly escaped from King Minos by building wings of wax and feathers. While Icarus flew so high that his wings melted, Daedalus warned him that the real danger was in flying too low, getting his wings weighted down by the water of the sea and losing his lift. Dr Teitelbaum warned that like Icarus, US research efforts are flying dangerously low, creating a loss of momentum. Just as Daedalus warned his son, this could result in a resounding crash.

The last portion of Dr Teitelbaum's address was a call for attendees to help reinvigorate government funding. He advocated for a doubling of NIH funding over the next decade that will allow researchers to take advantage of recent advancements in human health, such as the human genome. Advanced data informatics will also allow nutrition support professionals to align proteomics, metabolomics, and the microbiome. He also projected that the burgeoning field of personalized medicine will allow A.S.P.E.N. members to improve patient outcomes by meeting the nutritional needs of individual patients by addressing each patient's unique genetic and metabolic profile.

Figure 2. NIH Funding 1986 to 2013, Actual Dollars vs 1985 Dollars



No change after 1985.
NIH, National Institutes of Health; RPG, Research Project Grant.
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